

WHAT IS CLAIMED IS:

1. A gear change-speed unit for an automatic transmission, comprising:
 - an input part which receives rotation of a power source;
 - an output part arranged coaxially with the input part;
 - planetary-gear sets which provide transfer paths between the input and output parts; and
 - clutches and brakes arranged to be engaged and released selectively, the clutches and brakes selecting one of the transfer paths of the planetary-gear sets to change rotation of the input part at a corresponding gear ratio and provide it to the output part, the clutches and brakes allowing at least 6 forward speeds and 1 reverse speed by a combination of engagement and release of the clutches and brakes,
 - the first planetary-gear set comprising a first sun gear, a first pinion meshed with the first sun gear, a first ring gear meshed with the first pinion, and a first carrier supporting the first pinion, the first planetary-gear set reducing input rotation at all times,
 - the second planetary-gear set comprising a second sun gear, a second pinion meshed with the second sun gear, a second ring gear meshed with the second pinion, and a second carrier supporting the second pinion,
 - the third planetary-gear set comprising third and fourth sun gears, a third pinion meshed with the third and fourth sun gears, a third ring gear meshed with the third pinion, and a third carrier receiving and providing rotation between the third and fourth sun gears through a center member coupled to a side member which rotatably supports the third pinion, the third sun gear being close to the input part, the fourth sun gear being distant from the input part,
 - the second and third planetary-gear sets constituting a change-speed planetary-gear set, and
- 30 the first, second, and third planetary-gear sets being disposed in parallel in this order from the side of the input part.

2. The gear change-speed unit as claimed in claim 1, wherein the first and second clutches distributing output rotation of the first planetary-gear set to the change-speed planetary-gear set are arranged closer to the second planetary-gear set than the third planetary-gear set.

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3. The gear change-speed unit as claimed in claim 2, wherein the first and second clutches comprise respective pistons arranged on the side of the second planetary-gear set distant from the third planetary-gear set.

10 4. The gear change-speed unit as claimed in claim 1, wherein the third clutch directly providing rotation of the input part to the change-speed planetary-gear set is arranged at the outer periphery of the first planetary-gear set.

15 5. The gear change-speed unit as claimed in claim 4, wherein the third clutch comprises a piston arranged on the side of the first planetary-gear set close to the second planetary-gear set.

20 6. The gear change-speed unit as claimed in claim 1, wherein the output part is disposed between the first and second planetary-gear sets.

7. The gear change-speed unit as claimed in claim 1, further comprising a transmission casing provided with a wall, the transmission casing supporting the output part rotatably through the wall.

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8. The gear change-speed unit as claimed in claim 7, further comprising hydraulic passages formed through the wall, the hydraulic passages communicating with the first and second clutches.

30 9. The gear change-speed unit as claimed in claim 1, wherein the first and second brakes are arranged closer to the second planetary-gear set than the third planetary-gear set, the first and second brakes fixing rotary

members of the change-speed planetary-gear set.

10. The gear change-speed unit as claimed in claim 1, wherein the first and second brakes are arranged at the outer periphery of the first and
5 second clutches.

11. The gear change-speed unit as claimed in claim 1, wherein the first brake fixes the third carrier of the third planetary-gear set, and the second brake fixes the fourth sun gear of the third planetary-gear set distant from
10 the second planetary-gear set, wherein the first brake is disposed closer to the first planetary-gear set than the second brake.

12. The gear change-speed unit as claimed in claim 1, wherein the input part is coupled to the first ring gear, and the output part is coupled to an
15 integrated unit of the second carrier and the third ring gear,

wherein the first clutch engages and releases the first carrier from the second ring gear, the second clutch engages and releases the first carrier from the integrated unit, the third clutch engages and releases the third carrier from the input part, the first brake fixes the third carrier, the second brake fixes the fourth sun gear, and
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wherein it is obtained first speed by engaging the first clutch and the first brake, second speed by engaging the first clutch and the second brake, third speed by engaging the first and second clutches, fourth speed by engaging the first and third clutches, fifth speed by engaging the second and third clutches, sixth speed by engaging the third clutch and the second brake, and reverse speed by engaging the second clutch and the first brake.
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13. The gear change-speed unit as claimed in claim 1, wherein the input part is coupled to the first carrier, and the output part is coupled to an
30 integrated unit of the second carrier and the third ring gear,

wherein the first clutch engages and releases the first carrier from the second ring gear, the second clutch engages and releases the first ring

gear from the integrated unit, the third clutch engages and releases the third carrier from the input part, the first brake fixes the third carrier, the second brake fixes the fourth sun gear, and

wherein it is obtained first speed by engaging the first clutch and the
5 first brake, second speed by engaging the first clutch and the second brake,
third speed by engaging the first and second clutches, fourth speed by
engaging the first and third clutches, fifth speed by engaging the second
and third clutches, sixth speed by engaging the third clutch and the second
brake, and reverse speed by engaging the second clutch and the first brake.

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14. The gear change-speed unit as claimed in claim 12, further comprising:

a coupling member which couples the output part to an integrated
unit of the second carrier and the third ring gear, wherein the output part is
15 disposed between the first and second planetary-gear sets, the first and
second clutches are arranged at the inner periphery of the coupling
member, and the first and second brakes are arranged at the outer
periphery of the coupling member;

an outer member coupled to the first brake, the outer member
20 extending radially outward from the third carrier in a roughly axially middle
position of the third pinion, wherein the first brake is disposed closer to the
input part than the second brake;

25 a radial member which couples the second brake to the fourth sun
gear, the radial member extending radially outward from the fourth sun
gear; and

an intermediate shaft arranged through the second and third
planetary-gear sets,

wherein the third clutch is disposed at the outer periphery of the first
planetary-gear set, the third clutch comprising a drum coupled to the third
30 carrier through the intermediate shaft and the center member.

15. The gear change-speed unit as claimed in claim 13, further

comprising:

a coupling member which couples the output part to an integrated unit of the second carrier and the third ring gear, wherein the output part is disposed between the first and second planetary-gear sets, the first and
5 second clutches are arranged at the inner periphery of the coupling member, and the first and second brakes are arranged at the outer periphery of the coupling member;

an outer member coupled to the first brake, the outer member extending radially outward from the third carrier in a roughly axially middle
10 position of the third pinion, wherein the first brake is disposed closer to the input part than the second brake;

a radial member which couples the second brake to the fourth sun gear, the radial member extending radially outward from the fourth sun gear; and

15 an intermediate shaft arranged through the second and third planetary-gear sets,

wherein the third clutch is disposed at the outer periphery of the first planetary-gear set, the third clutch comprising a drum coupled to the third carrier through the intermediate shaft and the center member.

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16. The gear change-speed unit as claimed in claim 1, wherein the first planetary-gear set comprises a single-pinion type planetary-gear set.

17. The gear change-speed unit as claimed in claim 1, wherein the first
25 planetary-gear set comprises a double-pinion type planetary-gear set.

18. An automatic transmission with an input part for receiving rotation of a power source and an output part arranged coaxially with the input part, comprising:

30 planetary-gear sets which provide transfer paths between the input and output parts; and

clutches and brakes arranged to be engaged and released

selectively, the clutches and brakes selecting one of the transfer paths of the planetary-gear sets to change rotation of the input part at a corresponding gear ratio and provide it to the output part, the clutches and brakes allowing at least 6 forward speeds and 1 reverse speed by a
5 combination of engagement and release of the clutches and brakes,

the first planetary-gear set comprising a first sun gear, a first pinion meshed with the first sun gear, a first ring gear meshed with the first pinion, and a first carrier supporting the first pinion, the first planetary-gear set reducing input rotation at all times,

10 the second planetary-gear set comprising a second sun gear, a second pinion meshed with the second sun gear, a second ring gear meshed with the second pinion, and a second carrier supporting the second pinion,

15 the third planetary-gear set comprising third and fourth sun gears, a third pinion meshed with the third and fourth sun gears, a third ring gear meshed with the third pinion, and a third carrier receiving and providing rotation between the third and fourth sun gears through a center member coupled to a side member which rotatably supports the third pinion, the third sun gear being close to the input part, the fourth sun gear being
20 distant from the input part,

the second and third planetary-gear sets constituting a change-speed planetary-gear set, and

the first, second, and third planetary-gear sets being disposed in parallel in this order from the side of the input part.